

Tom Petty Problems $(g=9.81\text{m/s}^2)$

- 1) If a rock takes 0.750 s to hit the ground after being thrown down from a height of 4.80 m, determine the rock's initial velocity. [2.72 m/s [down]]
- 2) Having scored a touchdown, a football player spikes the ball in the end zone. If the ball was thrown down with an initial velocity of 2.0 m/s from a height of 1.75 m, determine how long it is in the air. [0.43 s]
- 3) An elevator moving downward at 4.00 m/s experiences an upward acceleration of 2.00 m/s^2 for 1.80 s. What is its velocity at the end of the acceleration and how far has it travelled? [0.400 m/s [down], 3.96 m]
- 4) A clown throws a ball upward at 10.00 m/s. Find
 - (a) the maximum height the ball reaches above its launch height. [5.10 m]
 - (b) the time it takes to do so. [1.02 s]
 - (c) the time it takes the ball to return to the clown's hand from maximum height. [1.02 s]
 - (d) the ball's final velocity. [-10.0 m/s]
- 5) The Slingshot drops riders 27 m from rest before slowing them down to a stop. How fast are they moving before they start slowing down? [23 m/s]
- 6) A pebble falls from a ledge 20.0 m high.
 - (a) Find the velocity with which it hits the ground. [19.8 m/s [down]]
 - (b) Find the time it takes to hit the ground. [2.02 s]
- 7) Why does it make sense that the time taken to travel up to the maximum height is equal to the time to fall back down to the starting height?
- 8) What variables determine how long a projectile is in the air? Does the answer surprise you? Why or why not?
- 9) What should be the value of the slope of the velocity-time graph for vertical projectile motion?
- 10) What determines how long it will take an object to reach the ground when released with an initial velocity of zero?
- 11) A student drops a bran muffin from the roof of the school. From what height is the muffin dropped if it hits the ground 3.838 s later? [72.3 m]
- 12) A rock takes 1.575 s to drop 2.00 m down toward the surface of the Moon. Determine the acceleration due to gravity on the Moon. [1.61 m/s^2 [down]]
- 13) At the beginning of a game, a referee throws a basketball vertically upward with an initial speed of 5.0 m/s. Determine the maximum height above the floor reached by the basketball if it starts from a height of 1.50 m. [2.8 m]
- 14) If the acceleration due to gravity on Jupiter is 24.8 m/s^2 [down], determine the time it takes for a tennis ball to fall 1.75 m from rest. [0.376 s]
- 15) If a baseball popped straight up into the air has a hang time (length of time in the air) of 6.25 s, determine the distance from the point of contact to the baseball's maximum height. [47.9 m]
- 16) A person in an apartment building is 5.0 m above a person walking below. She plans to drop some keys to him. He is currently walking directly toward a point below her at 2.75 m/s. How far away is he if he catches the keys 1.25 m above the ground? [2.4 m]
- 17) A rocket launched vertically upward accelerates uniformly for 50 s until it reaches a velocity of 200 m/s [up]. At that instant, its fuel runs out.
 - (a) Calculate the rocket's acceleration. [4.0 m/s^2 [up]]
 - (b) Calculate the height of the rocket when its fuel runs out. [$5.0 \times 10^3\text{ m}$]
 - (c) Explain why the rocket continues to gain height for 20 s after its fuel runs out.
 - (d) Calculate the maximum height of the rocket. [$7.0 \times 10^3\text{ m}$]